

DATE:

NAME:

CLASS:

CHAPTER 4**Understanding Lewis Diagrams****BLM 2-9****Goal** • Demonstrate your understanding of Lewis diagrams.**What to Do**

1. Complete the following table.

Name of Element	Period Number	Group Number	Number of Energy Levels	Number of Valence Electrons
helium		18		
			3	3
	2			6
strontium				
		14	3	
	6	2		

2. Draw the missing Lewis diagrams in the following table. Refer to a periodic table as necessary.

H						He:	
Li	Be·	B	·C·	·N·	·O:	F	:Ne:
Na	Mg	Al·	Si	P	S	·Cl:	:Ar:

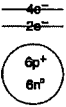
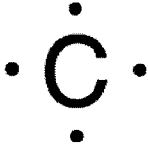
DATE:

NAME:

CLASS:

CHAPTER 4**Bohr Diagrams and Lewis Diagrams****BLM 2-10****Goal** • Practise drawing Bohr diagrams and Lewis diagrams.**What to Do**

Complete the following table by drawing both the Bohr diagram and Lewis diagram for each element. The first row is completed as an example.

Name of Element	Bohr Diagram	Lewis Diagram
carbon		
oxygen		
lithium		
chlorine		
magnesium		
phosphorus		

DATE:

NAME:

CLASS:

CHAPTER 4**Modelling Compounds****BLM 2-11**

Goal • Record your drawings for Think About It 4-1B, Modelling Compounds.

What to Do

Use these charts to draw Bohr diagrams and Lewis diagrams for Think About It 4-1B, Modelling Compounds, on page 181 of your student book.

Bohr Diagrams

Hydrogen	Lithium	Magnesium	Oxygen	Chlorine	Fluorine

Lewis Diagrams

Hydrogen	Lithium	Magnesium	Oxygen	Chlorine	Fluorine

CHAPTER 4**Binary Ionic Compounds****BLM 2-12**

Goal • Demonstrate your ability to write the names and formulas of binary ionic compounds.

What to Do

1. Complete the following table.

Name of Compound	Formula
(a) beryllium fluoride	
(b) sodium nitride	
(c) calcium sulphide	
(d) aluminum chloride	
(e) lithium oxide	
(f) magnesium nitride	
(g) gallium sulphide	
(h) barium bromide	

CHAPTER 4**Names and Formulas of Binary Ionic Compounds****BLM 2-13****Goal** • Use this page to review the names and formulas of binary ionic compounds.**What to Do**

1. Fill in the missing names of these ionic compounds.

Formula	Metal Ion	Name of Compound
(a) FeCl_3	Fe^{3+}	
(b) FeO	Fe^{2+}	
(c) Cu_2S	Cu^+	
(d) PbO_2	Pb^{4+}	

2. Fill in the missing formulas for these ionic compounds.

Name of Compound	Chemical Formula
(a) copper(I) oxide	
(b) lead(IV) bromide	
(c) iron(III) sulphide	
(d) nickel(III) fluoride	
(e) manganese(IV) sulphide	

3. Fill in the missing names for these ionic compounds.

Formula	Name of Compound
(a) Ti_2O_3	
(b) NaCl	
(c) CuCl_2	
(d) NO_2	

DATE:

NAME:

CLASS:

CHAPTER 4**Chemical Names and Formulas****BLM 2-14****Goal** • Review your understanding of chemical names and formulas.**What to Do**

Complete the following table.

Chemical Formula		Ionic or Covalent?	Name of Compound
1.	NH_4Cl		
2.			potassium sulphide
3.	Cl_4		
4.			calcium oxide
5.			ammonium chloride
6.	Li_3N		
7.	$\text{Mg}(\text{OH})_2$		
8.			zinc oxide
9.	CuNO_3		
10.			oxygen dichloride
11.	CuCl		
12.	FeCl_2		
13.			carbon tetrabromide
14.			aluminum chromate

CHAPTER 4**Chemical Compounds****BLM 2-15****Goal** • Use this page to identify chemical compounds.

1. Complete the following table.

Name	Formula	Ionic or Covalent?
(a)	NaCl	
(b)	MgO	
(c) lithium iodide		
(d) carbon dioxide		
(e) strontium hydroxide		
(f)	K ₂ S	
(g)	CuBr ₂	
(h) sulphur trioxide		
(i)	Ba ₃ (PO ₄) ₂	
(j) aluminum hydroxide		
(k) oxygen difluoride		
(l)	NH ₄ CN	
(m)	Fe(NO ₃) ₃	
(n) gold(III) sulphate		
(o) iron(II) carbonate		
(p) carbon tetraiodide		
(q)	FeI ₃	
(r) dinitrogen trioxide		

CHAPTER 4**The Crossover Method****BLM 2-16**

Goal • Learn an alternative method for writing formulas.

What to Do

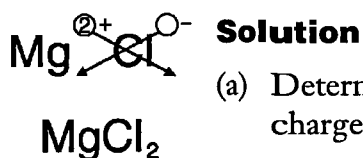
The crossover method is a shortcut that can help you determine the formula of an ionic compound. To use the crossover method, follow the steps below.

1. Write the formulas of the ions beside each other.
2. Cross over the magnitude (amount or size) of the charge on the cation (positive ion) so that it is the subscript for the anion (negative ion).
3. Cross over the magnitude of the charge on the anion so that it is the subscript for the cation.
4. Reduce to lowest terms if necessary.
5. Check your formula.

Model Problem 1

Determine the formula of each compound.

- (a) magnesium chloride
(b) calcium oxide

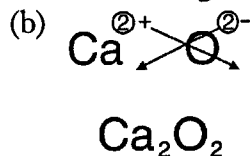


- (a) Determine the subscripts by crossing over the magnitudes of the charges. Remember that you do not write the number 1.

magnesium chloride

Check the formula by adding the charges on the ions: $+2 + [2 \times (-1)] = 0$

The total charge is zero. The formula is correct.



Because a formula shows the ratio of ions, you must write the simplest ratio. For calcium oxide, the simplest ratio of ions is 1:1.

CaO calcium oxide

Check the formula by adding the charges on the ions: $+2 + (-2) = 0$

The total charge is zero. The formula is correct.

The Reverse Method

You can use the reverse of the crossover method to determine the charge of a polyatomic metal ion in an ionic compound.

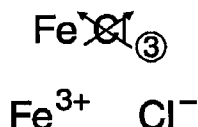
Model Problem 2

Determine the charge on Fe in each compound.

- (a) FeCl_3
(b) FeO

Solution

- (a) Use the reverse of the crossover method. Add the charge signs to each ion.

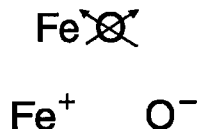


Remember that you do not write the number 1.

Check your answer. The charge on Cl is correct (1-), therefore the cation charge must be correct.

In FeCl_3 , the iron cation is Fe^{3+} .

- (b) Use the reverse of the crossover method. Add the charge signs to each ion.



Check your answer. The charge on O is incorrect. The oxygen anion should be 2-, not 1-. You need to double the charge on each ion. Therefore, the iron cation in FeO is Fe^{2+} .

Practice Problem

2. Use the reverse crossover method to determine the charge on the positive ion in each compound. Show your work.
- (a) Cu_2O
- (b) NiBr_2
- (c) PdO
- (d) TiO_2

CHAPTER 4**Check Your Understanding
Charts****BLM 2-17**

Goal • Use these charts to complete your answers to questions 6 and 11 on page 201.

What to Do

Record your answers below for questions 6 and 11 on page 201 of your student book.

6.

	Formula	Name	Number of Each Kind of Atom	Total Number of Atoms	Electric Charge on the Ion
(a)	CH_3COO^-				
(b)	HSO_3^-				
(c)	PO_4^{3-}				
(d)	CrO_4^{2-}				
(e)	$\text{Cr}_2\text{O}_7^{2-}$				
(f)	MnO_4^-				

11.

	Formula	Ionic or Covalent?	Name of Compound
(a)	Cl_2O		
(b)	CO_2		
(c)	CoO		
(d)	CO		
(e)	PbO_2		
(f)	MgCl_2		
(g)	PtCl_2		
(h)	SCl_2		
(i)	NaCH_3COO		
(j)	$\text{NH}_4\text{CH}_3\text{COO}$		

DATE:

NAME:

CLASS:

CHAPTER 4**Balancing Chemical Equations****BLM 2-18****Goal** • Practise writing skeleton equations and balanced equations.

1.

Word equation	iron + sulphur \rightarrow iron(II) sulphide
Skeleton equation	
Balanced equation	

2.

Word equation	calcium + oxygen \rightarrow calcium oxide
Skeleton equation	
Balanced equation	

3.

Word equation	calcium oxide + carbon dioxide \rightarrow calcium carbonate
Skeleton equation	
Balanced equation	

4.

Word equation	copper(II) oxide \rightarrow copper + oxygen
Skeleton equation	
Balanced equation	

5.

Word equation	barium chloride + potassium sulphate \rightarrow barium sulphate + potassium chloride
Skeleton equation	
Balanced equation	

6.

Word equation	potassium + water \rightarrow potassium hydroxide + hydrogen
Skeleton equation	
Balanced equation	

CHAPTER 4**Atomic Theory and Bonding****BLM 2-19****Goal** • Use this page to review the concepts of the atomic theory and bonding.**What to Do**

Circle the letter of the best answer.

- Which statement is true of elements in the same period in the periodic table?
 - They share similar properties.
 - They have the same atomic mass.
 - They cannot react with each other.
 - They have the same number of energy levels.
- Which Lewis diagram correctly represents a nitrogen atom?
 - $\cdot \ddot{\text{N}} \cdot$
 - $\cdot \ddot{\text{N}} \cdot$
 - $\cdot \ddot{\text{N}} \cdot$
 - $\cdot \ddot{\text{N}} :$
- How many protons does an atom of silver contain?
 - 47
 - 108
 - 61
 - 60
- What does a Lewis diagram show?
 - unpaired electrons only
 - valence electrons only
 - electrons from the innermost energy level only
 - all the electrons in an atom
- An atom is found to have seven valence electrons. To which family of elements in the periodic table does this atom belong?
 - noble gases
 - halogens
 - alkaline earth metals
 - alkali metals
- What is the nucleus of any atom, except hydrogen, made up of?
 - only neutrons
 - only protons
 - equal numbers of electrons and protons
 - neutrons and protons

DATE:

NAME:

CLASS:

BLM 2-19
continued

7. What is the name of the compound Fe_2O_3 ?
- A. iron(III) oxide
 - B. iron oxide
 - C. iron(II) oxide
 - D. iron(II) trioxide
8. What is the name of the compound S_2O_3 ?
- A. sulphur oxide
 - B. sulphur(III) oxide
 - C. sulphur trioxide
 - D. disulphur trioxide
9. What is the correct formula for the compound that contains magnesium and phosphate ions?
- A. MgPO_4
 - B. Mg_3PO_4
 - C. $\text{Mg}_2(\text{PO}_4)_3$
 - D. $\text{Mg}_3(\text{PO}_4)_2$
10. Which compound has no covalent bonds?
- A. Na_2SO_4
 - B. KCl
 - C. KClO_3
 - D. CH_3Cl
11. The name of PbSO_3 is
- A. lead sulphur oxide
 - B. lead sulphate
 - C. lead(II) sulphur oxide
 - D. lead(II) sulphite
12. What is the key difference between an ionic bond and a covalent bond?

CHAPTER 4

Atoms, Ions, and Compounds

BLM 2-20

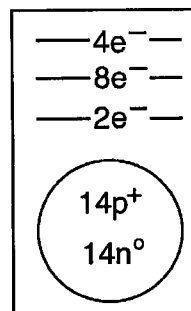
Goal • Use this page to review your understanding of atoms, ions, and compounds.

Circle the letter of the best answer.

- Which statement *best* fits the currently accepted model of the atom?
 - Electrons associated with specific energy levels surround the nucleus of an atom.
 - An atom is a sphere of positive charge in which electrons are embedded.
 - An atom is a small indivisible sphere.
 - An atom has a nucleus surrounded by positively charged particles.
- When metal atoms form ions in compounds, they tend to
 - gain electrons and form positive ions
 - lose electrons and form positive ions
 - gain electrons and form negative ions
 - lose electrons and form negative ions

- An Al^{3+} ion contains
 - 13 electrons and 13 protons
 - 10 electrons and 10 protons
 - 10 electrons and 13 protons
 - 13 electrons and 10 protons

- What does the diagram on the right represent?
 - a nickel ion
 - a silicon atom
 - a nickel atom
 - an oxygen ion



- If you were asked to draw electron Bohr diagrams for the following elements, which element would have a different number of occupied energy levels?
 - Mg^{2+}
 - F^-
 - Ne
 - Cl^-
- Which list includes only substances with no ionic bonds?
 - N_2O_4 , HBr, LiCN
 - CO_2 , NH_3 , N_2
 - SO_3 , BaCl_2 , O_2
 - NaCl, CH_4 , $\text{Al}(\text{OH})_3$

Use the following diagram to answer the next three questions.

[illegible]

7. Which unknown represents an element in the halogen family?
A. A
B. B
C. C
D. D
E. E
8. Which unknown represents an element that can be classified as a metalloid, having properties of both metals and non-metals?
A. A
B. B
C. C
D. D
E. E
9. An experiment shows that an unknown element does not easily lose or gain electrons. Which unknown represents this element?
A. B
B. C
C. D
D. E
E. E
10. The reaction of solid copper(II) oxide with hydrogen gas at high temperatures produces copper metal and water. Which chemical equation represents this reaction?
A. $\text{CuO}_2 + 2\text{H}_2 \rightarrow \text{Cu} + 2\text{H}_2\text{O}$
B. $\text{Cu}_2\text{O}_2 + 2\text{H}_2 \rightarrow 2\text{Cu} + 2\text{H}_2\text{O}$
C. $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$
D. $\text{Cu}_2\text{O} + 2\text{H} \rightarrow 2\text{Cu} + \text{H}_2\text{O}$

CHAPTER 4**Chemical Formulas Review****BLM 2-21****Goal** • Use this worksheet to review chemical equations and formulas.

Circle the letter of the best answer.

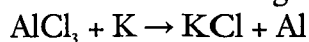
1. Which name and formula match correctly?

- A. magnesium fluoride, MgF_2
- B. sodium sulphide, NaS
- C. aluminum iodide, $\text{Al}(\text{IO}_3)_3$
- D. iron(II) oxide, FeO_2

2. Which is the formula for aluminum carbonate?

- A. AlC_3
- B. AlCO_3
- C. Al_2C_3
- D. $\text{Al}_2(\text{CO}_3)_3$

3. Which of the following sets of coefficients will balance the following skeleton equation?



- A. 1, 2, 1, 2
- B. 2, 6, 6, 1
- C. 1, 3, 3, 1
- D. 1, 2, 3, 1

4. Write the chemical formula for each of the following.

- (a) potassium nitride _____
- (b) lithium oxide _____
- (c) iron(II) sulphide _____
- (d) nickel(III) bromide _____
- (e) copper(I) oxide _____
- (f) nitrogen dioxide _____
- (g) nickel(III) carbonate _____
- (h) sodium phosphate _____
- (i) iron(III) hydroxide _____
- (j) ammonium sulphate _____

DATE:

NAME:

CLASS:

BLM 2-21
continued

5. Write the name for each of the following compounds.

(a) PbO_2 _____

(b) CuCl _____

(c) Fe_2S_3 _____

(d) $\text{Ni}_3(\text{PO}_4)_2$ _____

(e) CuCO_3 _____

6. (a) Write the corresponding skeleton equation for the following word equation.
calcium + water \rightarrow calcium hydroxide + hydrogen

(b) Balance the skeleton equation.

7. Draw Lewis diagrams for each of the following covalent molecules.

(a) carbon tetrachloride

(b) magnesium fluoride

8. Balance each of the following skeleton equations.

(a) $\text{HCl} + \text{Na}_2\text{CO}_3 \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$

(b) $\text{Al}(\text{OH})_3 + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2\text{O}$

DATE:

NAME:

CLASS:

CHAPTER 4**Chapter 4 Review Chart****BLM 2-22**

Goal • Use this page to record your answers to questions 11 and 18 in Chapter 4 Review.

What to Do

Use these charts to record your answers to questions 11 and 18 on page 217 of your student book.

11.

	Reactants	Name	Formula
(a)	sodium and nitrogen		
(b)	magnesium and oxygen		
(c)	aluminum and sulphur		
(d)	gallium and fluorine		
(e)	silver and selenium		
(f)	zinc and chlorine		

18.

	Formula	Ionic or Covalent?	Name of Compound
(a)	CaCl_2		
(b)	CuCl_2		
(c)	SCl_2		
(d)	CoS		